

PERPETRATED LARGELY BY
JEFF DUNTEMANN



GENERAL
TECHNICS

NO. 3 JULY 1976

MARS IS OURS!

I am in awe.

Only ten minutes ago, I looked out through the eyes of a spacecraft 214 million miles from Earth, and scanned an alien horizon. Rubble, dust, bright sky--and in my mind I filled in the shrill wail of a thin wind, the tiny hiss of sharp sand grains striking the craft's metal sides and in the sky a pale blue point not far from a small but savage sun disk. Yeah, that's us up there, on the bigger half of the Double Planet. The hand of Man has brushed fingertips with Mars.

I've only felt this way once before. By some insane coincidence, it was precisely seven years ago. I was a sweating teen-ager scouring pots in a grubby little Walgreens' Grill. Something else was on my mind, and when the pharmacist called customers and employees to the little TV at the camera counter, I rushed out there with a pot in one hand and a dripping Brillo pad in the other.

Moments later, the Eagle landed.

I wanted to shout and giggle and make noise, but the boss was watching too. I wanted someone to hug and spill all the dreams to that were welling up in my mind, but I had no one. (Though I met my Carol only ten days later, and the dreams have been put to good use.) So it was only me, the pot, and the Brillo pad who understood that this was what all human history had led up to, and without which all history would mean nothing.

And I remember the rage that burned in me when I read the so-called "humanists" asking in their snivelling tones why a nation should spend millions to go to the Moon while billions starved on Earth. Their idea of helping humanity is to stand on a street corner and hand out someone else's money. The notion that when Man stops reaching he starts crumbling is beyond their limited minds. The solid fact that enormous technological gain to all industry resulted from space research is beside the point. Those people would not know a gear shift from a shift register from a ten-day-old egg, anyway. Slaughter Apollo, they screamed, so that every poor man on Earth can be thrown a hamburger.

Why, indeed? Why go to the Moon? Why send clicking robots into space? A self-styled intellectual asked me that seven years ago. And now I answer:

Because, you dirty son of a bitch, some of us want to do a little more than be born, eat, shit, fuck, and die.

Enough bitterness. Today the techies triumph; it takes a chronic worrier like me to wonder if a man will ever land on Mars to take Viking 1 back to a berth in the Smithsonian. We will have our Space Shuttle; after that, let us pray. In the meantime, lift your glasses to Mars! It is ours!

Back in our own microcosm, General Technics is doing all right. By Issue Three we have gone beyond One or Two to Many. New members are pouring in; we'll have an updated membership list a little later. People are beginning to talk about us. Polish up your photon rifles and recharge your trekkie blinker batteries. MAC is only six weeks away. Let no one attend this Con of Cons who will not hear of General Technics.

People have said a lot of nice things about PyroTechnics. I've heard two requests the oftenest: More gizmos to build, and more humor. So be it. Problem is, I'm no engineer. If I'm going to print it, you're going to have to write it. Got a pet circuit or device that can be duplicated without too much hassle? Ship it over! I want cartoons and techie humor. I want news on what you're working on. I want Hints'n'Kinks. What do you want? I don't do this just to mess up a lot of 5" wide paper strips.

HAMFESTING IT UP

This past June 13th, General Technics discovered hamfests. Early in the morning myself, Gus, Kathy, Jim, Leah Dillon, and myself headed down to Santa Fe Park here for the annual Six Meter Club hamfest.

Picture about a thousand card tables stacked edge to edge, heaped high with a tremendously mixed bag of techie goodies. On one table you have utterly slimy WWII Command receivers, with plate caps cracked off the tubes, and on the next a wide selection of calculator and clock ICs.

The atmosphere is a cross between family picnic and raucous carnival. Gus had a cardboard box full of LEDs packed 20 in a package. On the side of the box he had written:

WALKING TABLE! LED'S 20 FOR A BUCK!

We wandered up and down the rows, pausing every so often for Gus to make a sale. I had a shopping list of items to be acquired for the Techie-Talkies and other projects, and the list was filled rapidly.

The admission tickets were thrown into a barrel from which winners were withdrawn and presented tools, electronic items, and household gadgets.

Radio-related items did predominate, but just barely. We also saw a metal cutting lathe, mixed computer hardware, lamps, teletypes, TVs, CBs, old magazines, beer cans, toys, tools of all sorts, telescopes, lawnmowers, every kind of test equipment imaginable, clocks, weather balloons, radio-controlled models, and nylon socks. Jim Fuerstenberg almost blew a fuse when he found a toy camera in the shape of Mickey Mouse's head. He got it for a buck.

Next year he'll probably sell it for fifty.

Gus sold a little more than 20 bucks worth of LEDs. We stopped for hot dogs, told a lot of jokes, and got sunburned. A chappie sold us several TouchTone pads for a fin each, when the going price was fifteen. The sun wasn't the only thing that was hot, we supposed...

All of us bought quite a bit of good glass-epoxy pc board selling for 50¢/lb. The quarter inch diameter micropots I found made the 1" x 3" TT receiver possible. In short, it was a great way to blow a Sunday afternoon.

Kathy even won a plastic wastebasket.

There is another, bigger hamfest at Santa Fe Park this August 8, Sunday. This time General Technics is going to do it right. We are going to be at the park at seven AM, earlier if I can dynamite the rest of you 8-balls out of bed a little sooner. We are going to have our own non-walking table, and we are going to sell LEDs and junk Xerox parts and barbecue Fireburgers and have one helluva good time. Anybody who wants to attend get h old of me right away so we can plan transportation. Out-of-towners can crash here. Bring your dough and your junk, and enjoy turning one into the other!!!!

♀ BIODATA

STEVE REUBART

was "born" in August of 1955, and was discovered shortly after by his parents-to-be in an obscure orphanage in Chicago. (His birth certificate is unique in that it has a space for "DATE HATCHED".) They carried him off to Rockford, Illinois, where he grew up to be an incredibly average student and amateur mad scientist.

Steve was always inventing strange devices. One of his more remarkable gadgets was a photo-electrically controlled soft-drink dispenser-- anyone putting a glass under the nozzle would break a light beam and activate a small electric pump. However, the plumbing connections on the damned ting left much to be desired, and soon anyone attempting to approach the device would receive a refreshing shower of Kool-Aide. Steve also dabbled in basic chemistry. One of his more notable experiments involved raiding his mother's kitchen and mixing a little bit of everything together, "just to see what will happen." When the glop (mixed in a tightly-capped Scope bottle) fermented, he had the dubious honor of inventing the world's first delayed-action glass-shrapnel stink bomb. The explosion occurred on the top shelf of his closet after he had forgotten the original experiment, and his mother spent several days trying to get rid of the odor of fermented pancake batter.

A devoted addict of DC comics, Steve decided he wanted to be a newspaper reporter--specifically Clark Kent. A short stint on the staff of the school newspaper convinced him that even a Man of Steel wuld have a tough time meeting story deadlines, so he postponed his journalism career indefinitely.

Moving to Huntsville, Alabama when his father was transferred, Steve got the chance to enroll in a course in data processing, and experienced his first flash of "techie ecstasy" (Techgasm? --Ed.) while running his fingers over the console of an NCR Century 200 computer. Excelling in programming, he had soon designed a game of tic-tac-toe which could cheat to win, and a computer dating program which had the amusing habit of matching applicants of the same sex. (Better not mention that down on Clark St. You'd be mobbed. --Ed.) Still, he managed to make straight A's during the three years of the course, and also managed to learn a thing or three about computers.

Enrolling at Ohio State in 1973, Steve planned to major in business computer science, but hastily switched to psychology (What? Another one? --Ed.) when he flunked the second of a series of seven math courses. He is now becoming bored playing with people's ids, but figures he will probably stick it out long enough to get his B.S. at UICC sometime in the next decade or so. He is currently circulation manager for STARWIND Magazine, adat processing manager for a wholesale wine distributor (a job he loathes intensely) (So get on the other end of that distributor's counter, already! --Ed.); he spends most of his spare time designing weird shit and attempting to organize a junk-laden apartment. According to his friends, his major activity consists of running up astronomically large long-distance phone bills with calls to Rockford, Chicago, Kalamazoo, and Florida--his current bill is somewhere near \$270! He enjoys reading Niven, Clarke, and Zenna Henderson, and is a closet Star Trek fan. He is madly in love with Carol Shuttleworth (in Gainesville, Florida) but doesn't know if they can handle an interracial relationship--she's half Vulcan and hes only half human most of the time. His passions include writing the filthiest filk-songs imaginable, designing thingies that are prohibitively expensive to build, and telling people that he will be starting to write the greatest SF novel ever done...as soon as he can find the extra time. His love of fandom keeps him broke most of the time, but he plans to be rich someday. (Anybody know the whereabouts of a big bank and a foolproof invisibility shield?)

GEORGE EWING

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Program: PYROTHREELATTER
Language: DAMITQL
Format: 42 CHTR SOM PICA

(insert logo here ifya wanta)

BIO Sketch:

Born 26MAY45 about 50km west of Galactic Capital in Elgin, Ill. Learned to read early, and achieved present speed before first exposure to Eyerot machine. Read a great deal of Von Braun/ Bonestell space & science fact stuff before discovering sf at age ten in Detroit airport by picking up copy of Leinster/Jenkins' Space Tug. Next came Jamieson's Bullard & the Space Patrol, sent to me as birthday gift by FBI chief of domestic counterespionage, along with autographed copies of Hoover's anticommie books. The Andre Norton cover blurb led me to all of her (their ??) stuff in public library, (Sault Ste. Marie, MI by this time) and thence through the yellow-rocket-and- red-atom emblem to the rest of hardback library SF.

The first nonprint media SF exposure was to the Saturday morning radio series Space Patrol, sponsored by Ralston-Purina. I sent away for all available boxtop stuff, and through that discovered the radio version of Tom Corbett. Local group of friends and I formed space club with tech help from USAF Radar tech from down the block who helped us with telescope building (9-inch photorecon lens refractor) and with clubhouse, which resembled the set of MASH. First SF Film seen; Riders to the Stars, a hokey sub-orbital meteor-catching project.

First SF on the 525-line monster was old Buck Rogers/Flash/ Don Winslow stuff run as after-school serial on Canadian TV.

Fantasy reading was at first limited to L. Frank Baum (love that underwater dome city & Queen COO-ee-oh's personal mini-sub!) Reading tended more to Rick Brant Tom Swift Hardy, etc. Saw Forbidden Planet when it came out, and have subliminally from then on associated synthesizer music and Ann Francis' thighs to this day.

Discovered electronics and hamming while in junior high, and had numerous adventures too complicated to relate here. High school brought Analog and the other magazines, and short-lived interest in chess, including Kriegspiel, cylindrical, various kinds of multilevel, and insane combinations of these. Was a 'Joiner' to the detriment of grades, but got scholarship to MTU, then finished up at MSU. Make living as school teacher, build things, and write, mostly sf and crime.

I attended the 73 East session of Clarion and met WB9MQY while trying to load up the same Mason Hall drainpipe on 40 Meters.

For additional details, see 76/77 edition of Who's Who in the Midwest, and any other like publications that SFWA sells names to.

Interests in addition to above:
wine, beer, & cheese making
printing, letterpress & offset
Geology, especially precambrian
Ontario Shield.
Music, Theater, etc.
Canoing, camping, fishing, etc.
history, especially pre-1700
Great Lakes
Much, much, more

G-SHIRTS

All right, gang, get ready to cover your brazen nakedness with a GT T-shirt. Steve Reubart has cracked the iron-on patch problem. A pal of his will do the screen for ten bucks, and only asks that we commit ourselves to at least 20 of the transfers at 40¢ apiece. The SR-51 tells me that is a mighty investment of 18 US dollars, and that won't break us. I personally will purchase five of the damned things right off, having a few places in mind to stick 'em.

We can even get T-shirts already imprinted for a paltry \$2.25 each, which is decent. The emblems will be pocket-sized, the standard General Technics logotype as given on Page 1. Shirt colors available are navy blue, light blue, gold, red, medium blue and maybe green. (What color is maybe green?) (Anything like possibly chartreuse?)

If we can scare up another ten bucks, we can have metallic silver ink. This would be right nice on a black or navy blue shirt. Ink colors for the standard run are black, white, and yellow-gold. The shirts can be done by MAC if we hustle our asses. Get your orders and dough to Steve half-past immediately!! Let us put up a united front at Worldcon!

Steve would also like to mention that his name-badges are on ice pending a delayed shipment from Chartpak. All things come to he who waits...

BEEP!

THE CARE & FEEDING OF TOUCHTONE PADS

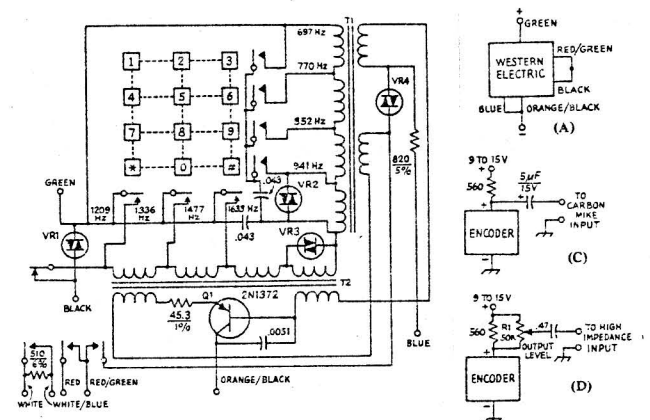
At the last hamfest down at Santa Fe Park, General Technics discovered a new toy--TouchTone pads. For a measly five bucks apiece we picked up a number of brand-new Western Electric units that never even made it into telephones.

The advance idea was a selective calling system for future Techie Talkies. In the meantime, they're fun to play with and immediately suggest quite a few remote-control applications.

The TouchTone system was designed before the era of integrated circuits. Our pads don't contain a single IC. They only active element is a single bipolar transistor. The pad presents an open circuit to the power input until a key is pressed, at which time it will draw 7 mils at 12V.

My great surprise in reading up on the TouchTone system is that each key represents two distinct audio tones. This makes possible 12 unique combinations with only seven separate tones. This makes for easy encoding, but adds the problem that 2 tone decoder ICs are required to unambiguously decode each digit.

I'm including a schematic of the pad here just to see if anybody can figure out how one transistor generates two audio tones at once. I have a few hunches, but I'd rather take an expert's word on it. Expert, where are you? Those double-ended diodes are silicon varistors, whatever a silicon varistor is. (A diac, perhaps?) Audio output from the pad is not high-level, but a good signal tracer amp will bring it up to ear-splitting loudness.

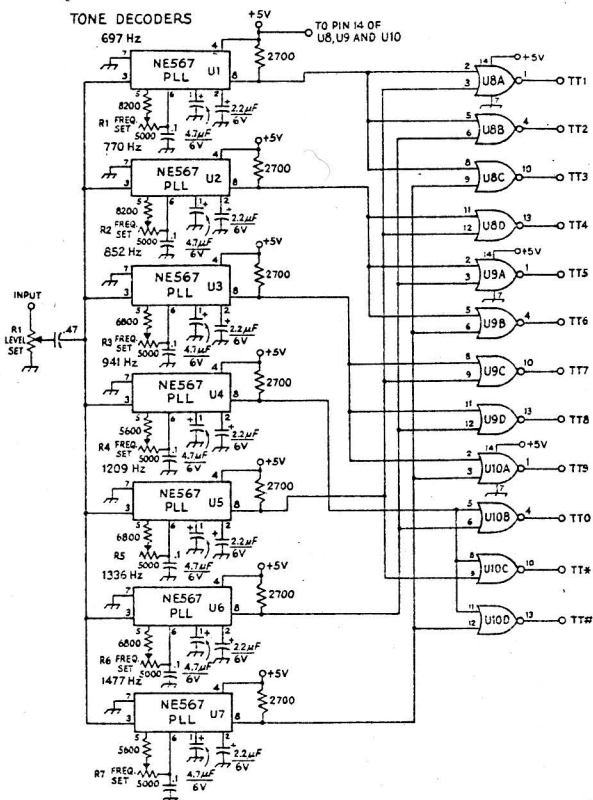


A very common use of these pads is the amateur radio "autopatch," a system by which a mobile radio unit can make phone calls from the field, by 2 meter (146 Mhz) FM. The pad modulates the FM carrier, and a receiver-decoder at the amateur op's base station passes the audio signal into the phone lines. The returning phone signals are sent by FM back to the mobile unit. The only difference from a normal call is that it isn't "duplex," you cannot speak and listen at the same time. Too bad, you ratchet-jaws.

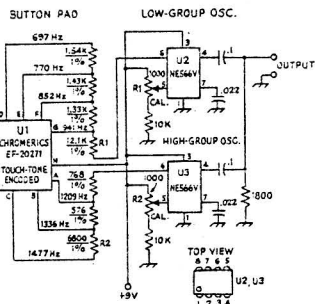
A complete decoder requires seven 567 tone decoders to decode all twelve keys. Each key pressed activates 2 567's, which are NORed together to produce an output-high at the appropriate output terminal. OR gates may be used if an output-low is desired.

We envision a Techie-Talkie system which incorporates a complete TouchTone pad on every unit. The receiver RF section is left on continuously; it is all-FET and draws only six mils. The audio amp is gated by an SCR. So normally the receiver is silent.

Each unit would be hard-wired to decode a unique 2-digit combination of keys. To contact any unit without disturbing any other unit, you simply key the transmitter and press the other unit's two digit number. The other unit would receive and decode the TouchTone signals and gate the SCR. The receiver would come on until the ground return to the entire decoding section was broken by a NC pushbutton switch. Then the amp is off until the next call comes in.



The problem with the phone pads is that they are big. A hand-held talkie would be a real hand-ful with a Western Electric unit hung on it. For a little more cash a miniature pad can be strung together using two 566 VCO chips and some (here's the catch) 1% resistors.



Late-breaking news on this front: Poly Paks' new catalog lists a miniature IC pad kit for 20 bucks, and I believe we can get loose parts and build our own for about fifteen. Yes, Tullio, perhaps that calculator-sized impossible wonder you keep bugging me to build is possible after all. And, perhaps we could work up our own version of autopatch...which means you could call Room Service at Worldcon on your way to your room and have supper waiting...or order a pizza during interminable Hugo banquet speeches...or call an ambulance when you're about to pass out inside your giant tribble suit...or...

-JD

FLASH & CHIPS DEPT.

BY STEVE JOHNSON

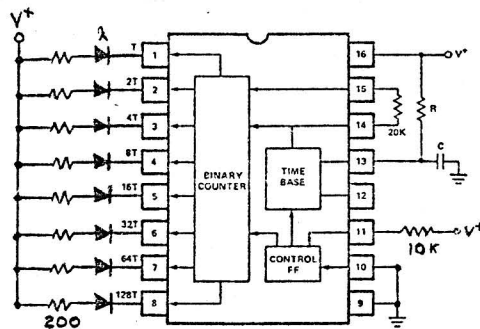
If you haven't yet played with the XR2240 you really shouldn't claim to be a techie--at least a trekkie blinker techie. The 2240 is a combination clock and 8-bit binary counter that will, I predict, become the NE-555 of your future. It has some really nice applications, and the ones I've found seem to be only the simpler ones...I'm sure with a little imagination you too can do all sorts of things with it.

The first application I discovered (don't ask Tullio--he'll claim that HE discovered it. I did. Honest. Well...) is a one-chip trekkie blinker circuit that Kleiner can't touch. (It sends bright red sparks flying to his fingers, just as if he were the Wicked Witch of the South making a grab for the Emerald Slippers. Quick, somebody drop a house on him...--Ed.) I'll give you the equations so you can play around with the components yourself. The equation of importance in all applications is

$$1T = RC$$

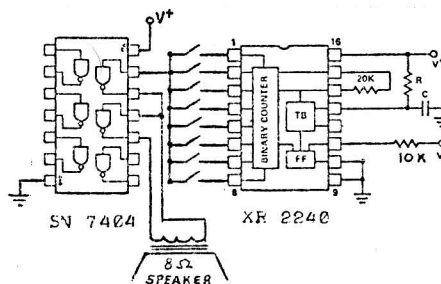
That is, the period of the first bit is the resistance in ohms times the capacitance in farads. Don't forget to express capacitance in farads. The period of the second bit is twice that, the period of the third bit four times that, and so on.

The blinker circuit is shown in figure one. The LEDs pass current from the positive supply through current limiting resistors (for uniform brightness) to the outputs of the 2240, which can sink up to 20ma or so per output. That's accord-



ing to the spec sheet. You can probably push it to 100mA or so without hurting it much. (Take it from him--he routinely operates TTL at 9V, and the gods have yet to vaporize him with their thunderbolts. --Ed.) The lights display a binary count from 0 to 255.

By coincidence, the outputs of a binary counter are musically one octave apart. In other words, bits 2-8 (or 1-7 if you are talking computers) are harmonics of bit 1 (bit 0, as above). Also, the outputs are square waves, which produce a more interesting sound than your run-of-the-mill sine wave. Even more interesting sounds are made when you combine the outputs in various ways. I think a light is dawning over your collective heads out there. (No--that's my sunburn.--Ed.) Yes, you can use the 2240 as a sort of mini-synthesizer! In fact, figure two is precisely that.



You may be wondering about tying the outputs of the 2240 together like that. Don't worry; it's designed that way. You may also be wondering what the 7404 is doing there. Well, it's an audio amplifier. Fixed gain, to be sure, but an audio amp none the less. A standard TTL 7404 can drive an 8 ohm speaker with no trouble at all if you hook it up right. What it's doing here is producing an AC waveform from a single-sided input. It's not really AC, but the speaker thinks so. (Fooing speakers is easier than you think--Ed.) So will any other floating-ground device. Or add some caps if you're a purist.

You're welcome to the circuit, but remember, you saw it here first. Next time, a programmable 1 second to 18 hour timer using 2 2240s and some switches.

THE MOB

People were coming in so thick and fast during assembly of #2 that I never quite had a chance to get a membership list that stayed in alphabetical order for more than a day or so. And I hate typing, regardless of what people say about me. So here we are, and if you aren't on the list, peace and love; you'll be in the next issue.

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*Gus Flassig (312) 262-0559
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*Bob Halloran (614) 424-5620
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Kurt Sakaeda
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Box 456 Minneapolis Minnesota 55440

That's the mob. If any of that data is incorrect, get the right stuff over here right away. Also supply phone numbers wherever I don't have them. And get working on your biographies. Writing about yourself should be the simplest thing you've ever done. (My, that sounds bad, come to think of it...) At least if you don't know your subject you have no one to blame but yourself.

TECHIE-TALKIES

In case you just tuned in, a Techie-Talkie is a small 2-way radio unit intended for short-range communications between GT masters through the volume of a good-sized hotel. It's barefacedly intended to buy us a little status among fans in addition to being a nifty way to keep in touch. I promise that they will be difficult as hell to eavesdrop on, provided the membership keeps its yap shut about frequencies etc.

The project has not been coming along as quickly as it should be. I have been thick in wedding plans and overtime, and hammering out this rag to boot. So bear with me. I hope to have a TT kit available to masters this spring. Anticipate two small pc boards and a battery pack inside a plexiglass case by Johnson and Proni, or a bare kit in case you'd rather sculpt the case your own way. How small the thing will be depends primarily on the smallness of components I can scrounge at the next hamfest or two.

Lots has happened since last issue. We now have our receiver. Getting there was lots of fun. I finished Mark II, only to find it liked to play open circuit. Nothing I could do to it would convince it to draw current. I tossed it aside and breadboarded Mark III. Mark III worked, yes, but in order to make it drive any reasonable audio amp I had to use an audio output transformer and that made it damned near as big as the hulking Mark I.

I figured I would have similar problems with any circuit using bipolar transistors. Bipolars are not know for high output impedences, making transformers necessary to match the 10K into the LM386 amp. I dismantled II & III and went back to Mark I.

I fudged LC ratios a little bit, and came up with a set of coils half the size of those in Mark I. Those coils, with the help of some superb microminiature pots and trimmers picked up at Santa Fe, enabled me to build a circuit identical to Mark I on a board less than one third the size.

It measures 1" by 3". I swear to God, you couldn't squeeze a squashed roach in between the parts on that board. It is a single FET super-regenerative detector behind a single FET RF amp. These two components draw six mils total. They feed an LM386 mini-dip audio amp directly, which can put two thirds of a watt into an 8 ohm speaker.

That audio amp draws 80 mils or so at 12V. That's a hefty pull from any battery, and presents a problem. Superregens are extremely sensitive to variations in supply voltage. If B+ dips even half a volt at any time the detector will cease regenerating and quit. This fact, plus the nature of our selective calling system (see the TouchTone article a little later) seems to suggest two separate supplies. Two SX-70 batteries in series can operate the detector continually for several days. Since the audio amp is gated anyway, a separate supply isolated from the detector supply would be convenient and not hard to rig, particularly since the LM386 can run on any voltage from 4 to 15 volts. I would suggest some 9V nicads with enough balls to lay out 100 mils or more for extended periods of time. A plop-in recharger is elementary.

As soon as I lay in a supply of microminiature parts at the next hamfest, I will design a receiver board.

The Transmitter has not been so nice to me.

Mark I went into thermal runaway the moment I turned it on and melted its final. That was the only good RF transistor I had. Subsequent fiddling failed to stabilize the damned thing. It generated about half a watt of general RF all over the place, and tended to overheat any final I plugged in. I scrapped it.

My usual ratsnest breadboarding technique probably had a lot to do with it. Mark II will make its debut on pc board, with nice short ground returns and shielding between stages. I'm waiting on a shipment of good VHF transistors. Don't despair, and tune in next issue for further tales of exploding finals and rampaging TVI!

SCROUNGE

BY GEORGE EWING, WASWTE

We've already discussed where to buy Mail Order 'tronics parts, and Jeff's article in 73 can give you an idea of how plentiful equipment scrounge can be. How about scrounge from other sources? I would like to see somebody start a regular PT column on scrounge. (OK, George, you're elected! --Ed.) Some starting thoughts that come to mind: B&W & color Polaroid film packs. Everybody knows about the little batteries in SX-70 packs, of course, but the older film packs are a source of thin, easily worked, flat black sheet metal that is ideal for small enclosures. We have all seen TV sets junked for components and power supplies, but how about the tempered sheets of uncuttable plate glass for table tops, light tables, geodome windows, etc? The thin walnut veneer in older cabinets is useful for hi-fi, ham, and bookshelf construction.

Old aluminum screen doors can be had for next to nothing, and yield lots of nice heavy aluminum channel for heat sinks, sheet metal for shields, chassis, etc.

Trac II and Schick razor cartridges come in little magazines with a clear styrene plate that pops off and is the right size for nametag, trekkie-blinker, radio dial, clock bezel, and all sorts of neat.

(Ed. would like to add that, when shopping for toothbrushes, pick one that comes in a heavy plastic tube that either separates in half or has a replaceable plastic top. These make dynamite logic probes, wireless mikes, M80 shrapnel cases and other assorted mayhemania.)

Antifreeze, paint, and stuff like duplicator fluid comes in rectangular metal gallon cans, sometimes, and these can be used for anything from modular bookshelves to gas cans. Each one yields about a square foot of sheet metal and quite a bit of loose solder.

Someday I'm going to take a metal GI can or oil drum, put a lot heat under it, and throw in all the junk plastic I can find. Anybody ever try it? (Not exactly. But I did throw a superball in a campfire once. Uggh.--Ed.) Seems if you were careful with the temp, you could cast a big slab of plastic on the sidewalk or something, and have a custom multicolored skylight for your next dome or camper. How about offgassing and migrating plasticizers? Any ideas?

Steel strapping is easy to scrounge at any warehouse or retail shipping place. Anybody got a use for a few miles of abandoned railroad track besides selling it for scrap? (VLF antennas?)

The pistol grip disposable flashlights that sell in gas stations for about a buck are ideal mockups for "phasers" and other blastwhammy weapons. Some of them even have belt clips in the right place.

Send your scrounge thoughts to Jeff. I'd also like to know how people have fared with the following outfits:

Fair Radio Sales SD Sales Airborne Sales
Meshna Anacrona JAN/Sentry/Savoy/IC
crystals

IT MAY OR MAY NOT COME IN THE MAIL

—THOUGHTS ON PARTS

I've dealt with two more surplus outfits since last time. Good news, and, well...

I sent for four strobe flash units from Delta Electronics on May 16. Today (July 21) they ambled by. That was only after I fired a nasty letter off. They shipped by UPS, but I don't know if that has anything to do with the delay.

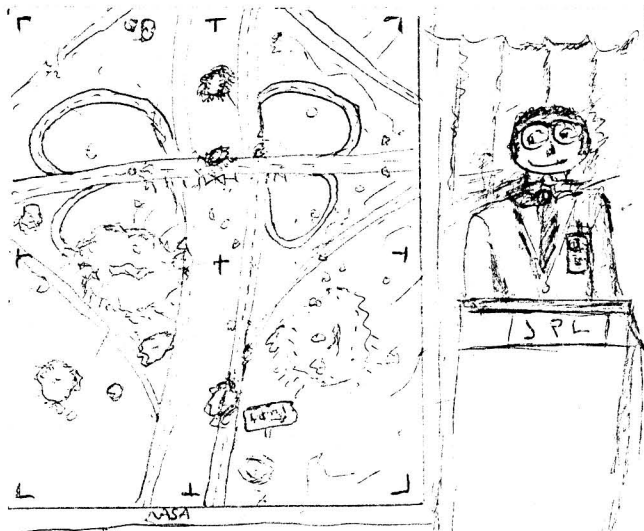
Two of the units worked fine the first time I tried them. One balked, and I had to resolder a couple of joints before it started, but it came around. The fourth was incomplete. The trigger transformer and part of the pc board was just plain missing. That is going back in the morning mail.

The message is, I suppose, beware of Delta. It's a shame, because they sent me their complete catalog, and they have a lot of things no one else does. They apparently buy a lot of salvage from Xerox, as I recognized some of the pc boards and a couple of counter units. I can get you the same stuff for nothing. I'd consider Delta a last resort case: don't buy unless you can't get it somewhere else.

The good news, at least for digital clock freaks: Get the S.D. Sales digital alarm kit. I gave it to myself as a birthday present. They shipped it in six days. Everything I ordered was there, and everything was good. The clock kit goes for 12.95. This is everything except the transformer and case. The clock uses the Mostek 50252 chip and readouts similar to DL707. It is a 6-digit alarm with snooze switch and PM indicator. The boards are on glass epoxy, plated, and drilled very accurately. All the parts with a couple of exceptions have cut and formed leads to fit the board. This is nice in the case of fifteen driver transistors. I lobbed it together in three hours and it worked the first time I turned it on. I put it in a TenTec case (\$5.00) and thus for \$17.95 I have a great little clock. A miniature speaker acts as the alarm, and it is so loud my subconscious wakes me up ten minutes before it goes off so it won't scare the crap out of me. After glancing at the digital clock review in August Radio Electronics, I don't think you can beat it.

On the subject of parts: I desperately need an edge connector with contacts .125" on centers, as big as possible, preferably with an even multiple of 12 contacts.

—JD



"Gentlemen, this latest Viking I photo proves that the strange straight markings on Mars that have puzzled astronomers for years are definitely not canals."

—EWING

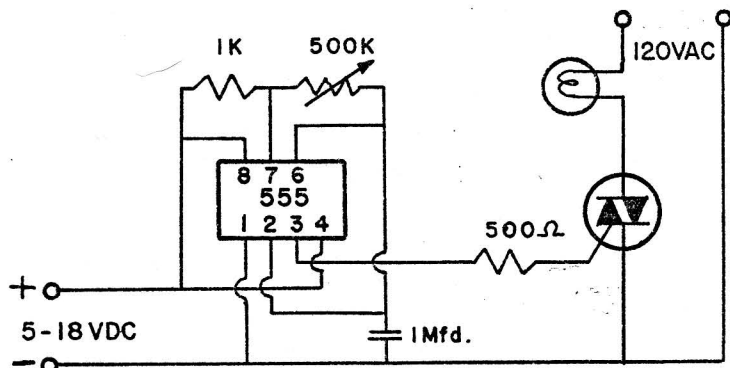


fig. 2

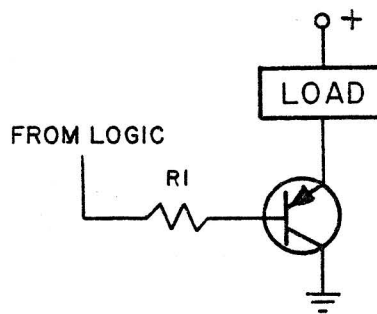


fig. 1

NOTES FROM THE UNDERGROUND (LABORATORY)

BY TULLIO PRONI

Greetings, fellow dribblers on (that's dabblers in, dammit! --Ed.) the secrets of the universe! The time has come to shed a little more light on the great mysteries of electronics. Thus if you haven't killed yourselves already, I shall dispense a little lecture on high-voltage safety.

We all know that it is current, and not just voltage, which kills. A little trifling 100 ma can send you to the underground. Permanently. True, about 40V are needed to overcome skin resistance, so no sweat about handling flashlight batteries. But what should you look out for at 100,000V that you needn't fear from your toaster?

Basically, distance. When working on a piece of electrical equipment you expect to be zapped if you touch the wrong thing. With high voltages you only need to get close. The 100,000V generator described last time can easily draw a 6cm arc. This means that even if your shoes are good insulators (which they probably aren't) and your floor is only a moderate conductor (dry cement) you need only get within 5.5cm to get zapped.

If you have to manipulate your apparatus while it's running, use a glass or plastic rod which is at least 2' long for every 100,000V you generate. Make sure that your rod is clean and dry. (What?--Ed.) Don't use wood. It has a nasty habit of becoming carbon and conducting like hell. (And to it.--Ed.)

The second thing to watch out for is leakage. A lot of things which seem like good insulators allow significant current to flow if the voltage is high enough. This is particularly good of floors--even wooden ones. You should always put your apparatus on some sort of insulator (glass is best) and make sure all controls are well-insulated. I once discovered that I couldn't turn my generator off because the entire control board was charged to 10,000V. Another nasty problem unique to high-voltage work is electrostatic attraction. Two wires with opposite charges will tend to pull together until they arc. This attraction can be quite strong and you can be the object a wire may be attracted to. So tie all wires down well.

Capacitors pose a few additional problems. First, assume all capacitors are charged--some can hold charges for months! Second, but never charge a cap beyond its rated voltage. You won't know the meaning of fear until you have an oil filled cap blow up in your face. Third, don't try to invent the AC electrolytic. Most electrolytics aren't much good for high voltage work anyway.

Enough said on safety. Let's drop down to 5 volts once again. One common problem is driving heavy current loads from TTL or other low-power logic. The usual method is a power transistor. Fig. 1 shows how it's done. Just remember that a PNP will turn on when the base is negative and that an NPN will turn on when the base is positive. Also, the emitter of a PNP should be tied to positive, and that of an NPN to negative. Fig. 1 shows a PNP transistor. The purpose of R_1 is to limit the base current and its value may be determined by replacing it with a pot and finding the highest value of resistance at which the PNP will turn on with a negative input at the base. Fig. 2 shows another variation. In this circuit a standard 555 oscillator is used to drive a triac which in turn strobes an incandescent lamp. While the effect is not quite so good as a neon strobe it is quite impressive.

All for now. Keep your soldering irons warm!

--CIAO

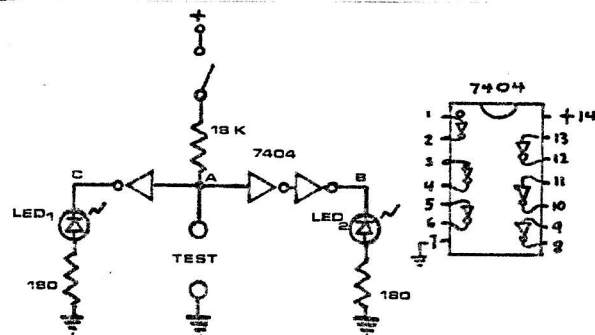
(Mmmm. Reminds me. Where's my Triscuits?)
--Ed.

JUNCTION POLARITY TESTER

I once watched a friend's home-made transmitter burn up on the bench because a pair of silicon rectifiers were mis-marked. I have been in the habit of testing diodes ever since then, to make sure they are neither shorted, nor open, nor mis-labeled.

It sounds easy enough. You check resistance both ways. High one way, low the other, and it's good--but what's the polarity on your voltmeter leads? Are you sure?

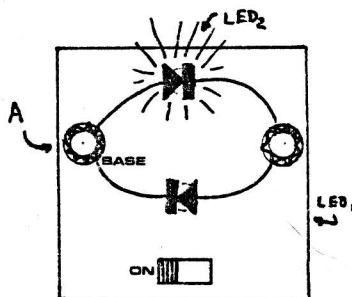
This little device will end that sort of indecision. You may think it nuts to have a separate box just to check diode polarity. Then again, it will also tell you if a diode's good or not--and come to think of it, it can indicate whether a bipolar transistor is PNP or NPN. But if you're a real gadgeteer, that's water over the damn. You'll build it because it's there.



Operation is simple. A diode between the test points with the cathode grounded will act as an open circuit. Voltage drop across R_1 is negligible and point A is held high. Point C is low, and point B--with two inverters acting as a driver becomes a current source for LED₂.

Connect the diode the other way across the test points, and it becomes a short. Point A is pulled low, forcing B low and C high, sourcing LED₁.

The real trick to this gizmo is in the front panel arrangement. I built mine on perfboard, inside a little plastic box. The top of the box I covered with opaque Contact plastic. I cut away plastic in the shape of a diode symbol over each LED. I then drew "leads" from the cutaway symbols to the two test binding posts.



When you turn it on, LED₂ will light. Connect the unknown across the posts. If you know the diode is good, the light will illuminate the symbol indicating correct orientation of the diode across the posts. If you're not sure of the quality of the unknown diode, reverse it. If LED₁ lights in both directions, the diode is shorted. If LED₂ lights in both directions, the diode is open. A good diode will force the diode symbols to "follow" its true polarity.

To test transistor polarity, always connect the base to point A. Either base or collector may go to point B. A PNP transistor will make LED₂ light; NPN will light LED₁. The short-open test works as well with transistor junctions as it does with diodes. Just think of a transistor as two diode junctions back-to-back, and you should be able to dope it out. Mark PNP or NPN over the appropriate diode symbol for the transistor test.

Your supply for the 7404 needn't be held slavishly at 5VDC. Six or even nine volts will do. The only catch is that instead of lasting for a thousand years, the chip may only last twenty five or thirty. Better tape a spare 7404 inside the plastic box--just in case they're no longer manufacturing TTL in 2001.

A MONODE PRIMER

BY DAVE CORNER

PART 1 EARLY HISTORY

The next five years are going to give birth to an unprecedented upheaval in the electronics industry, particularly digital electronics. The monode has come of age, and awaits only large scale capital investment to become a mainstay of the industry.

Even today, however, few electronic engineers and fewer hobbyists are more than nodding acquaintances with the One and Only. Admittedly, with its incomplete mathematical underpinnings, and consequent difficulty in developing useful applications, there hasn't been much to hear about. But the advent of modern mathematics tailored to the solution of the basic problems of nuclear physics, has resulted in a wealth of practically-oriented spinoff to the engineering disciplines, and the fundamentally new concepts needed to master the monode are now at hand, along with the requisite supporting technology.

Many otherwise well-versed people are startled to find that the monode is a prehistoric discovery; indeed, possibly pre-Homo Sapiens! Repeated findings in widely scattered ancient ruins (notably Angkor Wat, Chichen Itza, Gizeh, and the Plains of Nazca), of lengths of wire terminated by wooden or stone beads at one end, lend incontrovertible evidence to the early discovery of the device. There are those who scoff at the Ancient Monodes Theory, implying that the artifacts are in fact simply brooch pins or hair pins, by pointing out their proximity to necklaces and other articles of clothing; even woven into the hair of a mummy in one case. But the consistent size and configuration of them, worldwide I emphasize, is weighty evidence indeed to contest.

It has also been recently confirmed that strips of carbonized oxide (resembling Edison's first successful lamp filament!) with stone beads attached, found in recently unearthed remains of campfires in southern France, carbon date to 19,000 B.C.!! They are unmistakably monode-like.*

We can hardly blame the ancients for burying the monodes with their inventors. It has also been a thorn in many a Skyptical Experimentere's side from the time of the Renaissance until the mid-twentieth century.

The first relatively modern monodes are credited to Evangelista Torricelli, who began his endeavors in 1642. He invented the mercury barometer the following year, which strongly resembles a large monode standing on end. No doubt he used the liquid metal as a means of readily changing its length, and became so engrossed with the tricks the atmosphere played on it that he dropped further investigation altogether.

It is known that Benjamin Franklin also tackled the problem about 1765, from scattered interviews biographers held with younger acquaintances after his death. He used them atop Leyden jars (the now-familiar stem and ball), but he found that when he capped the ball with a wooden or gutta-percha insulator to form a true monode, the device ceased to function. Since he could not, in any case, reconcile any of its behaviour with his positive/negative electrical fluids theory, he too gave up in despair.

The nineteenth century was, comparatively, a sleeper century for Le Single Lead Miserable. Such great men as Heinrich Hertz, Karl Frederic Gauss, and Nikola Tesla wrestled with it; Thomas Edison and Charles Proteus Steinmetz rejected it outright; while lesser known characters, among them Nathan Stubblefield and Mahlon Loomis, fared no better with their unconventional ways. This era, however, marks the end of infamy and defeat for one of mankind's earliest innovations. "Two leads are better than one" may soon become a thing of the past.

NEXT ISSUE: The Twentieth Century: Age of the Monode

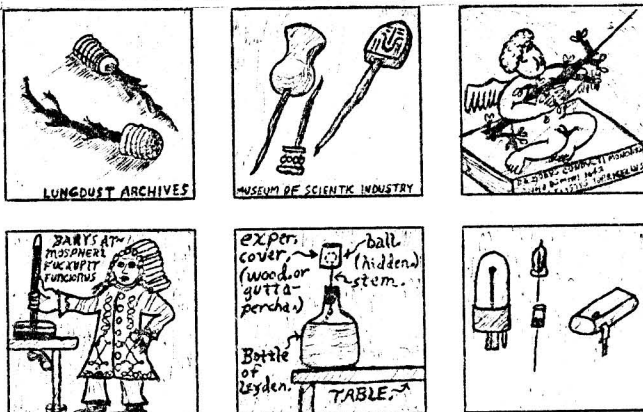


Fig. 1. (a) oxide-and-wampum monodes, ca. 19,000 B.C. (b) ancient monodes, ca. 2450-925 B.C. (c) and (d) two of Evangelista Torricelli's monodes, solid and liquid types. (e) Benjamin Franklin Leyden jar monode. (f) representative modern monodes--Loctal base and 'peanut' vacuum monodes, plastic case monode with identifying band at lead end, and newer single inline package, TTL-compatible monode. (Loctal base version courtesy of Steven Johnson, private collection.)

* Even further back--read T. Earl Grey's article 1976--The Monode's Two Millionth Birthday (Astounding Electronics, May '76, p.42), discussing the discovery of fossilised pine twigs embedded endwise into blobs of amber, probably the work of distant cousins of Zinjanthropus Man. They appear to have been fascinated with its lack of reaction to lightning, considering the relatively good conductivity of the then-fresh pine twigs. This property of monodes will be discussed.